UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/774,400	02/10/2004	Benjamin Arnette Lagrange	839-1383	9775

30024 7590 06/23/2010

NIXON & VANDERHYE P.C.
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203

EXAMINER	
VERDIER, CHRISTOPHER M	
ART UNIT	PAPER NUMBER
3745	

MAIL DATE	DELIVERY MODE
06/23/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/774,400	LAGRANGE ET AL.	
	Examiner	Art Unit	
	Christopher Verdier	3745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 March 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10,12-20 and 29-62* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10,12-20,29-45,48,49,52,53,55,56,59 and 60* is/are rejected.

7)☒ Claim(s) *46,47,50,51,54,57,58,61 and 62* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *2-10-04, 8-15-07* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5-17-10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Applicant's Amendment dated May 17, 2010 has been carefully considered but is non-persuasive. Applicant has amended independent claims 10 and 29 to overcome the rejections under 35 USC 112, first and second paragraphs. Correction of these matters is noted with appreciation.

Applicant has amended independent claim 10 to recite that the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 20.782° with the center line; and has amended independent claim 29 to recite that the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively define a point of a line that forms an angle of 20.782° with the center line. The examiner agrees with Applicant's arguments that amended claim 29 is no longer anticipated by Webb 3,202,398 and Johnson 5,147,180. However, as set forth throughout the prosecution of this application, the angle of the uppermost tangs of a bucket (which is defined by the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket that each respectively define a point of a line that forms an angle with the center line) is a result-effective variable which, when optimized, reduces the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the specific angle of the two upperm3ost tangs of a bucket to be a specific value, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). The same argument applies to amended claim 10.

Applicant's additional arguments pertaining to the rejection of claims 10 and 13-19 under 35 USC 103(a) as being unpatentable over Webb in view of By; the rejection of claim 12 under 35 USC 103(a) as being unpatentable over Webb and By and further in view of United Kingdom Patent 677,142; the rejection of claim 20 under 35 USC 103(a) as being unpatentable over Webb and By and further in view of Caruso; the rejection of claim 33 under 35 USC 103(a) as being unpatentable over Webb; the rejection of claims 34-40 under 35 USC 103(a) as being unpatentable over Webb in view of Leonardi; the rejection of claims 41-43 under 35 USC 103(a) as being unpatentable over Pisz in view of By; the rejection of claims 44-45, 55-56, and 59-60 under 35 USC 103(a) as being unpatentable over Heinig in view of By; the rejection of claims 48-49 under 35 USC 103(a) as being unpatentable over Heinig and By and further in view of Phipps; and the rejection of claims 52-53 under 35 USC 103(a) as being unpatentable over Johnson in view of By, are disagreed with for the reasons set forth in the Examiner's Answer mailed January 21, 2010.

Information Disclosure Statement

The information disclosure statement filed May 17, 2010 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. Specifically, there is no explanation of the Office Action issued in Japanese Application number 2005-

032418. It has been placed in the file, but the information referred to in the Office Action issued in Japanese Application number 2005-032418 has not been considered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 10 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 in view of By 6,461,110. Webb discloses a turbine substantially as claimed, comprising a wheel 10 having plural broach slots 22, each having an interleaved system of fillets and tangs, and plural buckets 16 each having a corresponding interleaved system of fillets and tangs so that the plural buckets can be filled, one to one, into the plural broach slots, with the

interleaved system of fillets and tangs on the buckets and wheelposts 34 inherently acting to reduce stresses acting on the fitted buckets and wheelposts (due to the dovetail shape), the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces. The straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively define a point of a line that forms an angle of with the center line, and a point defined by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle with the center line. The buckets and wheelposts have three interleaved tangs and fillets. Each of the buckets has a bottommost tang 18 formed from unnumbered curved surfaces having more than one radius of curvature (at the bottom of the tang and the top of the tang). Each bucket has straight surfaces (the leading and trailing edges). Each of the wheelposts has an unnumbered bottom fillet formed from curved surfaces having more than one radius of curvature (at the bottom and at the top). Each wheelpost includes unnumbered straight surfaces.

However, Webb does not disclose that the turbine is formed such that first and second stages each have a wheel having sixty broach slots (claim 10), and does not disclose that the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets each respectively define a point of a line that forms an angle of 20.782° with the center line (claim 10).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being

sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Webb such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Webb such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets each respectively defining a point of a line that forms an angle of 20.782° with the center line is a matter of choice in design. The angle of the two uppermost tangs of a bucket (which is defined by the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets that each respectively define a point of a line that forms an angle with the center line) is a result-effective variable which, when optimized, reduces the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the specific angle of the two uppermost tangs of a bucket to be a specific value,

resulting in the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting each of the buckets each respectively defining a point of a line that forms an angle of 20.782° with the center line, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and By 6,461,110 as applied to claim 10 above, and further in view of United Kingdom Patent 677,142. The modified turbine of Webb shows all of the claimed subject matter except for the bucket tangs having an angle of 55 degrees.

United Kingdom Patent 677,142 shows a turbine having a rotor with unnumbered buckets having tangs 3 which are formed at an angle of 55 degrees, for the purpose of providing more favorable stress conditions in the turbine buckets and rotor.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Webb such that the bucket tangs have angles of 55 degrees, as taught by United Kingdom Patent 677,142, for the purpose of providing more favorable stress conditions in the turbine buckets and rotor.

Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and By 6,461,110 as applied to claims 14 and 16, respectively above. The modified

turbine of Webb show all of the claimed subject matter except for the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 18), and except for the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches (claim 19).

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches, and the recitation of the wheelpost bottom fillet having radii of curvatures of .3822 inches and 0.5616 inches are deemed to be matters of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature in the modified turbine of Webb such that the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet are specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, and such as .3822 inches and 0.5616 inches for the wheelpost bottom fillet, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim 20, as far as it is definite and understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 and By 6,461,110 as applied to claim 10 above, and further in view of Caruso 6,030,178. The modified turbine of Webb shows all of the claimed

subject matter, including unnumbered wheelposts, but does not show that the outer tang edge of each wheelpost is scalloped so as to reduce the weight of the turbine wheel.

Caruso (figure 1) shows a turbine wheel 10 having wheelposts shown generally at 12, which are formed such that an unnumbered outer tang edge of each wheelpost is scalloped, for the inherent purpose of reducing weight of the turbine wheel.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Webb such that the outer tang edge of each wheelpost is scalloped, as taught by Caruso, for the purpose of reducing weight of the turbine wheel.

Claims 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398. Webb discloses a buckets 16 for insertion into wheelposts 34 of a turbine rotor 10, the buckets being formed from interleaved unnumbered fillets and tangs which complement interleaved fillets and tangs (near 22) formed in the wheelposts, the interleaved system of fillets and tangs on the buckets and wheelposts acting to reduce stresses acting on the fitted buckets and wheelposts, the fillets and tangs of the interleaved system each being formed by a combination of curved and straight surfaces, with the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively defining a point of a line that forms an angle of with the center line, and a point defined by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle with the

center line. The bucket has three interleaved tangs and fillets. The bucket has a bottom tang 18 formed from curved surfaces having more than one radius of curvature. The bucket further includes at least one straight surface (the leading and trailing edges).

However, Webb does not disclose that the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively define a point of a line that forms an angle of 20.782° with the center line.

The recitation of the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively defining a point of a line that forms an angle of 20.782° with the center line is a matter of choice in design. The angle of the two uppermost tangs of a bucket (which is defined by the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket that each respectively define a point of a line that forms an angle with the center line) is a result-effective variable which, when optimized, reduces the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the specific angle of the two uppermost tangs of a bucket to be a specific value, resulting in the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively defining a point of a line that forms an angle of 20.782° with the center line, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 29-32 are also rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson 5,147,180. Johnson discloses buckets 12 for insertion into unnumbered wheelposts of a turbine rotor 20, the buckets being formed from interleaved fillets and tangs 22, 24, 26, 28, 30, 32 which complement unnumbered interleaved fillets and tangs formed in the wheelposts, the interleaved system of fillets and tangs on the buckets and wheelposts acting to reduce stresses acting on the fitted buckets and wheelposts, the fillets and tangs of the interleaved system each being formed by a combination of curved and straight surfaces, with the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively defining a point of a line that forms an angle of with the center line, and a point defined by intersecting tangent lines along pressure faces of the bottommost tang does not lie on either line that forms the angle with the center line. The bucket has three interleaved tangs and fillets. The bucket has a bottom tang 32 formed from curved surfaces having more than one radius of curvature. The bucket further includes at least one straight surface 30a, 30b. The straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively define a point of a line that forms an angle of about 18° with the center line.

The recitation of the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively defining a point of a line that forms an angle of 20.782° with the center line is a matter of choice in design. The angle of the two uppermost tangs of a bucket (which is defined by the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket that each respectively define a point of a line

that forms an angle with the center line) is a result-effective variable which, when optimized, reduces the stresses in the blade roots and the grooves. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the specific angle of the two uppermost tangs of a bucket to be a specific value, resulting in the straight surfaces of each of the two uppermost tangs on each side of a center line bisecting the bucket each respectively defining a point of a line that forms an angle of 20.782° with the center line, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 as applied to claim 31 above. The modified turbine of Webb shows a turbine substantially as claimed as set forth above, including the bucket having a bottom tang 18 formed from curved surfaces having more than one radius of curvature.

However, the modified turbine of Webb does not show the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches (claim 33).

The recitation of the curved surfaces of the bucket bottom tang having radii of curvatures of .3762 inches and .5556 inches is a matter of choice in design. The radii of curvature of curved surfaces of the bucket bottom tang are known in the art to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been

further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the curved surfaces of the bucket bottom tang and of the wheelpost bottom fillet to be specific values, such as .3762 inches and .5556 inches for the bucket bottom tang, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 34-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Webb 3,202,398 as applied to claims 30 and 31 above, and further in view of Leonardi 4,191,509. The modified turbine of Webb shows a bucket substantially as claimed as set forth above, but does not show the upper tang formed from curved surfaces with more than one radii of curvature (claims 34-35), and does not show the intermediate tang 30 formed from curved surfaces with more than one radii of curvature (claims 37-39).

Leonardi (figures 1-2 and 4) shows a bucket 18 having a root 16 with an upper tang 28 formed from curved surfaces with more than one radii of curvature R1, R2, and an intermediate tang 28 having more than one radius of curvature R1, R2, for the purpose of improving low cycle fatigue, and reducing combined bending and shear stress.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified bucket of Webb such that the upper tang is formed from curved surfaces with more than one radii of curvature, and intermediate tang is formed

from curved surfaces with more than one radii of curvature, as taught by Leonardi, for the purpose of improving low cycle fatigue, and reducing combined bending and shear stress.

Claims 41-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pisz 4,824,328 in view of By 6,461,110. Pisz (figures 1-6 and Table 7) discloses a turbine substantially as claimed, comprising a wheel 21 having broach slots 19, each having an interleaved system of fillets and tangs, and a plurality of buckets 15 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the buckets and broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, wherein above the uppermost tang on each of the buckets there is a compound fillet having a first radius of curvature R1 of 0.3128 inches and a second radius of curvature R2 having 0.0873 inches. Below the upper most tang on each of the buckets there is a fillet having a radius of curvature R5 of 0.0477 inches. Above the bottom most tang on each of the buckets there is a fillet having a radius of curvature R10 of 0.0477 inches.

However, Pisz does not disclose that the turbine has multiple stages (claim 41), does not disclose that that first and second stages have the above fillet and tang configurations (claim 41), does not disclose sixty broach slots that receive sixty buckets (claim 41), does not disclose that above the uppermost tang on each of the buckets the compound fillet has a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches (claim 41), does not

disclose that below the upper most tang on each of the buckets the fillet has a radius of curvature of 0.0741 inches (claim 42), and does not disclose that above the bottom most tang on each of the buckets the fillet has a radius of curvature of 0.0897 inches (claim 43).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Pisz to include multiple stages and such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the Pisz such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the uppermost tang on each of the buckets the compound fillet having a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches, the recitation that below the upper most tang on each of the buckets the fillet has a radius of

curvature of 0.0741 inches, and the recitation that above the bottom most tang on each of the buckets the fillet has a radius of curvature of 0.0897 inches, are deemed to be matters of choice in design. The radii of curvature of the bucket tangs are recognized by Pisz to be result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radii of curvature of the bucket tangs to be specific values, such as the uppermost tang on each of the buckets having the compound fillet with a first radius of curvature of 0.3342 inches and a second radius curvature of 0.0983 inches, such as below the upper most tang on each of the buckets the fillet having a radius of curvature of 0.0741 inches, and such as above the bottom most tang on each of the buckets the fillet having a radius of curvature of 0.08975 inches, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinig 5,176,500 in view of By 6,461,110. Heinig discloses a turbine substantially as claimed, comprising a wheel 18 having broach slots 16, each having an interleaved system of fillets and tangs, and a plurality of buckets 9 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the buckets and broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces,

wherein for each one of the plurality of buckets the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet is 0.9480 inches (figure 4). For each one of the plurality of buckets, the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang appears to be greater than 60 percent of the distance 0.9480 inches.

However, Heinig does not disclose that the turbine has multiple stages (claim 44), does not disclose that that first and second stages have the above fillet and tang configurations (claim 44), does not disclose sixty broach slots that receive sixty buckets (claim 44), does not disclose that for each one of the plurality of buckets the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet is 1.9836 inches (claim 44), and does not disclose that for each one of the plurality of buckets the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang is 0.8429 inches (claim 45).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Heinig to include multiple stages and such that a

first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of the Heinig such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet being 1.9836 inches, and the recitation of the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang being 0.8429 inches are matters of choice design. These dimensions are recognized by Heinig to be result-effective variables which when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the distance from the bottom of the bottom most tang to the upper most straight portion of the upper most fillet to be a specific value, such as 1.9836 inches, and to select the distance from the bottom of the bottom most tang to a first intersection point of tangent lines drawn along pressure faces of the tang adjacent to the bottom most tang to be 0.8429 inches, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinig 5,176,500 and By 6,461,110 as applied to claims 44 and 45, respectively above, and further in view of Phipps 6,893,226. The modified turbine of Heinig shows all of the claimed subject matter except for the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang being 50 degrees.

Phipps shows a turbine blade 30 having an angle between an upper most straight portion of an upper most fillet 52 and an upper most straight portion of an upper most tang being 55 degrees, for the purpose of allowing the blade to withstand centrifugal loading when in operation.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Heinig such that the angle between the upper most straight portion of the upper most fillet and the upper most straight portion of the upper most tang is 55 degrees. The specific recitation of this angle being 50 degrees is a matter of choice in design. This angle is known to be a result-effective variable which adjusts the stress distribution in the blade roots. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified turbine of Heinig such that this specific angle is 50 degrees, for the purpose of optimizing the stress distribution in the blade roots, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson 5,147,180 in view of By 6,461,110. Johnson discloses a multiple stage turbine substantially as claimed, comprising a wheel 20 having unnumbered broach slots, each having an interleaved system of fillets and tangs, and a plurality of buckets 10 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the buckets and broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, wherein below the uppermost tang on each of the broach slots there is fillet (corresponding to R3, R4) having a radius of curvature of about 0.0721 inches, and above a bottom most tang on each of the broach slots there is a fillet (corresponding to R11) of about 0.0945 inches.

However, Johnson does not disclose that the first and second stages have the above fillet and tang configurations (claim 52), does not disclose sixty broach slots that receive sixty buckets (claim 52), does not disclose that below the uppermost tang on each of the broach slots the fillet has a radius of curvature of 0.0959 inches (claim 52), and does not disclose that above the bottom most tang on each of the broach slots the fillet has a radius of curvature of 0.1037 inches (claim 53).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Johnson such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Johnson such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation that below the uppermost tang on each of the broach slots the fillet has a radius of curvature of 0.0959 inches, and that above the bottom most tang on each of the broach slots the fillet has a radius of curvature of 0.1037 inches, are matters of choice in design. Johnson recognizes that these are result-effective variables which, when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the radius of curvature of the uppermost tang on each of the broach slots of the fillet to have a specific radius of curvature,

such as 0.0959 inches, and to select the radius of curvature above the bottom most tang on each of the broach slots of the fillet to have a specific radius of curvature, such as of 0.1037 inches, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 55-56 and 59-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heinig 5,176,500 in view of By 6,461,110. Heinig discloses a turbine substantially as claimed, comprising a wheel 18 having unnumbered broach slots, each having an interleaved system of fillets and tangs, and a plurality of buckets 9 each having a corresponding interleaved system of fillets and tangs so that the plurality of buckets can be fitted, one to one, into the broach slots on the wheel, wherein the interleaved system of fillets and tangs on the buckets and broach slots act to reduce stresses acting on the fitted buckets and broach slots, the fillets and tangs of the interleaved system of fillets and tangs each being formed by a combination of curved and straight surfaces, wherein for each one of the broach slots the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang is 0.9500 inches (figure 3). For each one of the plurality of broach slots, the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet appears to be greater than 60 percent of the distance 0.9500 inches.

However, Heinig does not disclose that the turbine has multiple stages (claim 55), does not disclose that that the first and second stage has the above fillet and tang configurations (claim 55), does not disclose sixty broach slots that receive sixty buckets (claim 55), does not disclose that for each one of the broach slots the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang is 1.9836 inches (claim 55), does not disclose that for each one of the plurality of broach slots, the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet is 0.8433 inches (claim 56), and does not disclose that for each one of the broach slots the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet is 50 degrees (claims 59 and 60).

By (figures 1 and 8) shows a turbine near 40, having plural stages having a first stage wheel 44 and a second stage wheel 42, with the number of buckets on the first stage wheel being sixty, for the purpose of providing a turbine of providing a gas turbine engine of acceptable efficiency with acceptable loads on the first stage wheel.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Heinig to include multiple stages and such that a first stage wheel has sixty broach slots, as taught by By. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the turbine of Heinig such that it includes a second stage wheel having sixty broach slots, as a mere duplication of the arrangement of the first stage, because one of ordinary skill in the art would have recognized that

the number of broach slots disclosed by By would also be applicable to the second stage wheel, for the purpose of also providing a gas turbine engine of acceptable efficiency with acceptable loads on the second stage wheel.

The recitation of the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang being 1.9836 inches, the recitation of the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet being 0.8433 inches, and the recitation of the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet being 50 degrees, are matters of choice design. These lengths and this angle are recognized by Heinig and in the art to be result-effective variables which when optimized, reduce the stresses in the blade roots and the grooves. It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to select the distance from the bottom of the bottom most fillet to the upper most straight portion of the upper most tang to be a specific value, such as 1.9836 inches, to select the distance from the bottom of the bottom most fillet to a first intersection point of tangent lines drawn along pressure faces of the fillet adjacent to the bottom most fillet to be 0.8433 inches, and to select the angle between the upper most straight portion of the upper most tang and the upper most straight portion of the upper most fillet to be 50 degrees, for the purpose of reducing the stresses in the blade roots and the grooves, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Allowable Subject Matter

Claims 46, 47, 50, 51, 54, 57, 58, 61, and 62 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Christopher Verdier/
Primary Examiner, Art Unit 3745

Christopher Verdier
Primary Examiner
Art Unit 3745